

REMARKS/ARGUMENTS

Claim 1 is amended by this response. Claim 2 is canceled. No claims are added. Accordingly, claims 1 and 3-5 remain pending in the instant application.

Embodiments in accordance with the present invention relate to a gas distribution face plate having characteristics promoting uniform deposition of material on a substrate. As depicted schematically in FIG. 15A (reproduced below), the inventors observed that gases flowed through conventional showerheads (1500) having orifices (1500a) of widths of about 0.029 inches (29 mils), could result in formation of a material layer (1512) of uneven thickness, owing to different velocities of the gas at the center (V_C) versus edge (V_E) of the substrate:

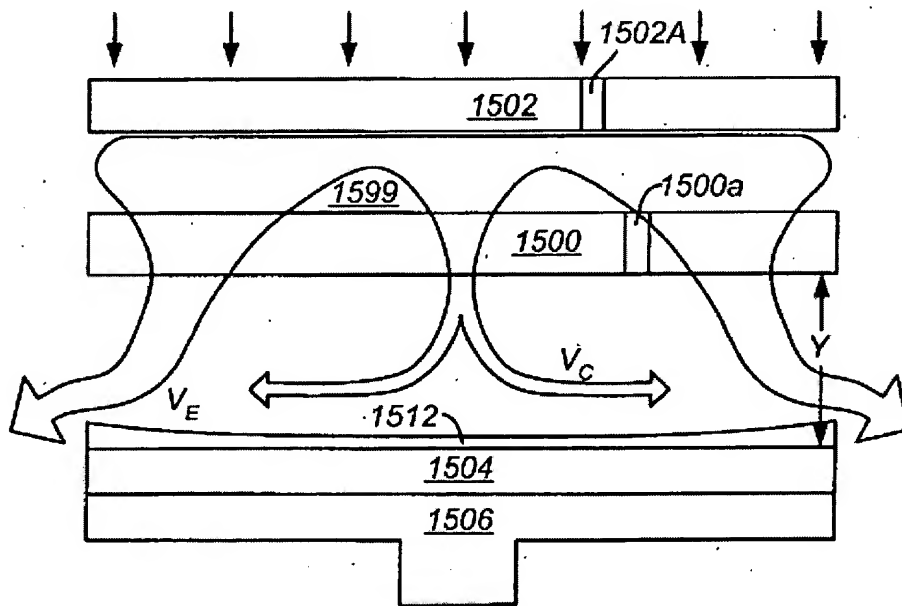


FIG. 15A

A new face plate design was proposed having orifices of narrower width of between about 0.010-0.018 inches (10-18 mils), in order to promote a uniform pressure drop across edge and center portions of the faceplate, and hence uniform gas velocities resulting in the deposition of a layer of uniform thickness. The results are shown in FIG. 16 reproduced below:

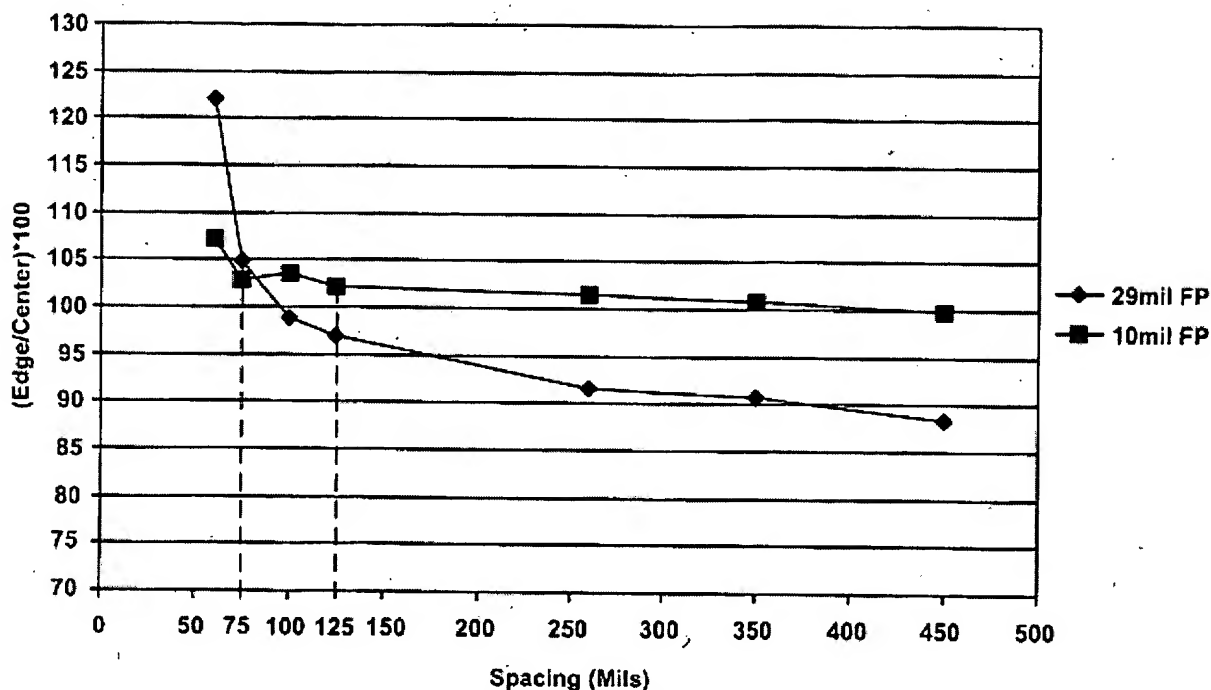


FIG. 16

FIG. 16 reveals that films formed by gas flows through the novel faceplate (FP) having orifices of width of 10 mils (0.010"), exhibited superior uniformity as compared with films formed by gas flows through a conventional faceplate (FP) having orifices of width of 29 mils (0.029"). In particular, the films deposited utilizing the novel faceplate exhibited less variation in thickness over a substantially wider range of faceplate-to-wafer spacings.

Moreover, FIG. 16 also shows a profound lack of predictability in the relationship between the two curves, particularly at narrow faceplate-to-wafer spacings. This unpredictability reflects the considerable time and effort required by the inventors to develop a faceplate having the desired characteristics.

In order to emphasize the importance of the orifice width parameter, sole pending independent claim 1 has now been amended to incorporate the range of orifice widths recited in dependent claim 2:

1. A gas distribution face plate comprising:
a face plate body having a thickness defining a number of inlet orifices having a width of between about 0.010" and 0.018" and a depth, at least one parameter selected from the number, the width, and the depth configured to create

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a uniform pressure drop of between about 0.8 and 1 Torr across edge and center regions of the faceplate as gas is flowed through the inlet orifices, whereby a thickness of material deposited at an edge of a wafer varies by 3% or less from a thickness of material deposited at a center of the wafer, when the wafer is separated from the face plate by a gap of between about 75 and 450 mils.

In the latest office action, the Examiner rejected the claims as anticipated under 35 U.S.C. §102(e) by U.S. patent no. 6,454,860 to Metzner ("the Metzner Patent"). These anticipation claim rejections are overcome as follows.

As a threshold matter, the Examiner is respectfully reminded that claims 1-5 stand rejected as anticipated, and not merely obvious, in view of the Metzner Patent:

[t]he distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. (Emphasis added; MPEP 706.02)

Here, the Metzner Patent contains no teaching, implicit or even implied, regarding each element of claim 1. For example, the Metzner Patent consistently teaches a showerhead structure exhibiting orifices having widths equivalent to, or even larger than, those of the conventional showerheads distinguished by the present invention:

Inlet 291 is axially symmetric to aperture centerline 267 and could be cylindrically shaped with a diameter 247 of 0.028 inches. (Emphasis added; col. 10, lines 8-10)

* * *

inlet diameter 247 is less than outlet diameter 288 or inlet diameter 247 could be about one-third of outlet diameter 288 such as when a representative aperture 249 has an inlet diameter 247 of 0.028 inches (Emphasis added; col. 10, lines 34-38)

* * *

Utilizing the ratios above, representative dimensions for each of a plurality of apertures 249 in a representative showerhead 240 fabricated from aluminum having a thickness of about 0.5 inches are: an inlet diameter 247 of about 0.028 inches (Emphasis added; col. 10, lines 52-56)

* * *

Inlet 291 is axially symmetric to aperture centerline 267 and could be cylindrically shaped with a diameter 247 of 0.110 inches. (Emphasis added; col. 11, lines 4-5)

* * *

Given the above ratios, dimensions for each of a plurality of representative apertures 238 in an aluminum showerhead 240 having a thickness of about 0.4 inches are: an inlet diameter 247 of about 0.110 inches (Emphasis added; col. 12, lines 12-15)

There is absolutely no teaching or suggestion in the Metzner Patent regarding use of inlet orifices having widths even approaching the ranges recited by claim 1. Because the Metzner Patent fails to teach, explicitly or even impliedly, each and every element of the pending claims, it is respectfully asserted that the anticipation claim rejection has been overcome. Accordingly, for at least these reasons, continued maintenance of the anticipation claim rejections is improper, and these claim rejections should be withdrawn.


The Examiner has also rejected the pending claims as obvious under 35 U.S.C. §103, in view of Japanese Patent No. JP 04154116 to Toki ("the Toki Patent"). These claim rejections are overcome as follows.

A complete English language translation of the Toki Patent is submitted herewith for the Examiner's review. Review of this translated document indicates that the Toki Patent fails to teach, or even suggest, all of the elements of the pending claims.

Specifically, the Toki Patent contains absolutely no teaching regarding the width of the disclosed orifices. And as described in detail above in connection with FIG. 16, the correlation between orifice size and showerhead performance is not predictable, and hence derivation of the claimed orifice width ranges cannot legitimately be regarded as merely the result of routine experimentation by the inventors.

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,


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